Vipac Engineers & Scientists Ltd.
4/5 Leo Lewis Close, Toronto, NSW 2283, Australia
PO Box 306, Toronto, NSW 2283, Australia
t. +61 2 4950 5833 | **f.** +61 2 4950 4276 | **e.** huntervalley@vipac.com.au
w. www.vipac.com.au | A.B.N. 33 005 453 627 | A.C.N. 005 453 627

Vipac Engineers & Scientists

Ian Easton Architect

St. Phillips Christian College, Gosford

Noise Impact Assessment - DA Submission

29N-15-0139-TRP-473008-0

26 Feb 2016

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DOCUMENT NO: 29N-15-0139-TRP-473008-0 **PREPARED FOR:** Ian Easton Architect 112 The Lane Wickham, New South Wales, 2293, Australia **CONTACT:** Ian Easton **Tel:** +61 2 4969 1360 **Fax:** +61 2 4969 1359	**REPORT CODE:** TRP **PREPARED BY:** Vipac Engineers & Scientists Ltd. 4/5 Leo Lewis Close, Toronto, NSW 2283, Australia **Tel:** +61 2 4950 5833 **Fax**: +61 2 4950 4276

PREPARED BY: Author:	 Lynne Tan Project Engineer	Date: 26 Feb 2016
REVIEWED BY: Reviewer:	 Darragh Kingston **Manager – Hunter Valley/Newcastle** **Team Leader - Acoustics**	Date: 26 Feb 2016
AUTHORISED BY:	 Darragh Kingston **Manager – Hunter Valley/Newcastle** **Team Leader - Acoustics**	Date: 26 Feb 2016

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EXECUTIVE SUMMARY

Vipac Engineers and Scientists Ltd. (Vipac) was commissioned by Ian Easton Architects to carry out a Traffic Noise Impact Assessment of a proposed Junior School building within the grounds of St. Phillips Christian College located at 2-30 Narara Creek Road, Narara (Lot 102 DP 832279) NSW 2250.

The development is proposed on land with a frontage to a classified road (Manns Road); therefore pursuant to Clause 101 of the State Environmental Planning Policy (Infrastructure) 2007, a Noise Impact Assessment has been requested. The purpose of this report is to assess the potential noise intrusion into the proposed new Junior School Building.

The recommendations regarding the building's glazing, walls and roof specifications required in order to achieve the relevant internal noise levels are presented in **Section 6**.

By following the recommendations and requirements outlined within this noise impact assessment, the proposed building design is expected to achieve an acceptable noise environment, internally within the property.

Service rooms such as toilets, store rooms etc. are not assessed in this report for the reason that these areas are not habitable rooms.

It is Vipac's professional opinion that the proposed Junior School Building is acceptable from an Acoustic point of view, provided the recommendations detailed in **Section 6** are implemented.

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1 INTRODUCTION

Vipac Engineers and Scientists Ltd. (Vipac) was commissioned by Ian Easton Architects to carry out a Traffic Noise Impact Assessment of a proposed Junior School building within the grounds of St. Phillips Christian College located at 2-30 Narara Creek Road, Narara (Lot 102 DP 832279) NSW 2250.

The development is proposed on land with a frontage to a classified road (Manns Road); therefore pursuant to Clause 101 of the State Environmental Planning Policy (Infrastructure) 2007, a Noise Impact Assessment has been requested. The purpose of this report is to assess the potential noise intrusion into the proposed new Junior School Building. The site location (outlined in red) is shown in **Figure 1.**

Figure 1: Noise Monitoring Locations

2 GLOSSARY OF TERMS

A list of commonly used acoustical terms (and their definition) used in this report is provided in **Table 1** as an aid to readers of the report.

Table 1: Definition of Acoustical Terms

Term	Definition
$L_{Aeq,1hr}$	Equivalent Continuous Noise Level - which, lasting for as long as a given noise event has the same amount of acoustic energy as the given event for the period of an hour.
$L_{A10,1\ hr}$	The noise level, which is equalled or exceeded for 10% of the measurement period of an hour
$L_{A90,period}$	The noise level, which is equalled or exceeded for 90% of the measurement period. An indicator of the mean minimum noise level for the period 7am to 10pm or the period 10pm to 7am (whichever is relevant) and is used in Australia as the descriptor for background or ambient noise.
$L_{Aeq,Period}$	The equivalent continuous A-weighted sound pressure level that has the same mean square pressure level as a sound that varies over time. It can be considered as the average sound pressure level over the measurement period.
L_n	The Sound Pressure levels that is equalled or exceeded for n% of the interval. Commonly used noise level are 1,10,90 and 99%
$L_{A10,18hrs}$	The L_{10} noise level for the period 6am to midnight.

3 EXISTING NOISE ENVIRONMENT

3.1 UNATTENDED NOISE MONITORING

Vipac installed noise logging equipment at a number of locations within the St. Phillips Christian College site to measure baseline environmental noise levels at representative locations on the proposed new junior school building site. The location of the monitoring points are listed in **Table 2** and shown in **Figure 2**.

Table 2: Monitoring Locations

Loc.	Date	Location / Address	Instrument	Serial No.
N1	08/02/2016 – 16/02/2016	Within St. Phillip Christian College footprint at the bottom of embankment and close to the road (approximately 45 meters to road kerb of Manns Road)	LD 870	1461
N2	08/02/2016 – 16/02/2016	Within St. Phillip Christian College footprint at the top of embankment and close to the road (approximately 38 meters to road kerb of Manns Road)	LD 870	1457
N3	08/02/2016 – 16/02/2016	Within St. Phillip Christian College footprint at the top of embankment and further away from the road (approximately 75 meters to road kerb of Manns Road)	Duo dB1	10292

The instruments were programmed to accumulate noise data continuously over sampling periods of 15-minutes for the entire monitoring period. Internal software then calculates and stores the L_n percentile noise levels for each sampling period, which can later be retrieved for detailed analysis.

The instruments were calibrated using a Rion NC-73 calibrator immediately before and after monitoring and showed a maximum error of 0.5 dB.

Meteorological data during the noise logging survey was obtained from the Bureau of Meteorology (BoM) Weather Station at Gosford NSW (061425). Where adverse meteorological conditions such as wind exceeding 5m/s and/or rain were observed in any 15-minutes period, these data were excluded.

A summary of current ambient noise levels at the noise monitoring locations N1 – N3 is presented in **Table 3** and graphically illustrated in **Appendix A**.

Table 3: Summary of current traffic noise impact dB(A)

Monitoring Locations	Day Period				Night Period			
	$L_{A10,15hr}$	$L_{Aeq,15hr}$	$L_{A90,15hr}$	$L_{Aeq,1hr}$	$L_{A10,9hr}$	$L_{Aeq,9hr}$	$L_{A90,9hr}$	$L_{Aeq,1hr}$
N1	56	54	48	58	54	51	46	56
N2	65	64	48	66	65	62	44	67
N3	58	56	50	59	58	53	50	57

Figure 2: Noise Monitoring Locations

3.2 ATTENDED NOISE MEASUREMENTS

In addition to the unattended noise logging surveys, Vipac also conducted short period 15-minute attended noise measurements at the baseline monitoring locations (N01 to N03) to quantify the dominant and contributory noise sources associated with the overall ambient noise levels in the area. The results of the attended noise surveys at each monitoring location are presented in **Table 4**.

Table 4: Attended Noise Survey results

Loc.	Date & Time	L_{Aeq}	L_{A90}	Description
N01	08/02/2016 12:50	53	44	The overall noise environment was dominated by the traffic noise from Manns Road, insects and birds noise. In the absence of traffic noise, the environment was dominated by the insects and birds noise. Kids playing in the school were audible at times.
N02	08/02/2016 14:13	52	49	The overall noise environment was dominated by traffic noise on Manns Road. Insects noise and insects noise were faintly audible at this monitoring location.
N03	08/02/2016 13:58	55	50	The overall noise environment was dominated by the traffic noise from Manns Road and to a lesser extent insects and bird noise. Kids playing at the preschool were slightly audible at this monitoring location.

4 NOISE CRITERIA

4.1 DEVELOPMENT NEAR RAIL CORRIDORS AND BUSY ROADS – INTERIM GUIDELINE

This Guideline is based on the State Environmental Planning Policy (Infrastructure) 2007 (the "Infrastructure SEPP"). This guideline sets out the internal noise levels for developments with the potential to be impacted by traffic noise.

The infrastructure SEPP sets out the following criteria for internal noise levels from airborne traffic noise:

For Clause 102 (Road Corridors):

If the development is for the purpose of a building for non-residential buildings, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following $L_{eq,15hours}$ levels are not exceeded:

- Educational Institution including Child Care Centres – 40dBA (in the building)

If the internal noise levels with windows or door open exceed the criteria by more than 10dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed. In other words, the noise criteria for an educational institution with windows or door open is $L_{eq,15hour}$ 50dBA.

5 PROPOSED JUNIOR SCHOOL BUILDING FACADE

The traffic noise intrusion assessment was carried out based on the baseline noise levels detailed in **Section 3** and the information provided by Ian Easton Architect, as detailed in **Table 5**.

Table 5: Information Received

Drawing Reference	Drawing title	Issued Date
438-S09	Lower Level 2, Site & North East View	August
438-S10	Entry Level	August
438-S11	Lower Level 1	August
438-S12	Elevations & Section	August

At this stage of the project, (i.e. Development Application stage), a schedule of doors and windows for the proposed development is not available and therefore, Vipac used the elevation drawings to determine the door and window dimensions. **Table 6** and **Table 7** detail the dimensions of the doors and windows for entry level and Lower Level 1 of the building.

Table 6: Room, Window and Door Dimensions for Entry Level

Room Type/Reference	Area (m^2)	Height (m)	Volume (m^3)	Dimension (m^2)							
				Northern Façade		Southern Façade		Eastern Façade		Western Façade	
				Window	Door	Window	Door	Window	Door	Window	Door
Kinder	184	2.7	496.8	10.2	8.8	8.9	-	-	-	-	-
Quiet 1	24	2.7	64.8	5.0	-	-	-	-	-	-	-
Year 1	181	2.7	488.7	10.2	8.8	1.6	-	-	-	-	-
Quiet 3	24	2.7	64.8	2.6	-	1.6	-	-	-	-	-
Year 2	182	2.7	491.4	10.2	8.8	3.2	-	-	-	-	-
Boys Toilet	28	2.7	75.6	-	-	-	-	-	10.1	-	-
Girls Toilet	30	2.7	81.0	-	-	-	-	-	10.1	-	-
Access WC	10	2.7	27.0	-	-	-	-	-	1.9	-	-
Gallery	270	2.7	729.0	-	-	13.0	-	13.2	4.3	6.0	3.8
Staff Study	64	2.7	172.8	-	-	6.5	-	5.0	2.2	-	-
WC1	8	2.7	21.6	-	-	1.1	-	-	-	-	-
WC2	8	2.7	21.6	-	-	1.1	-	-	-	-	-
Office 1	15	2.7	40.5	-	-	2.2	-	-	-	2.5	-
Office 2	12	2.7	32.4	-	-	-	-	-	-	2.5	-
Interview	19	2.7	51.3	-	-	-	-	-	-	2.5	-
WC1	5	2.7	13.5	-	-	-	-	-	-	0.8	-

Table 7: Room, Window and Door Dimension for Lower Level 1

Room Type/Reference	Area (m^2)	Height (m)	Volume (m^3)	Dimension (m^3)	
				Northern Façade	
				Window	Door
Year 3	184	2.7	496.8	10.3	8.6
Quiet 5	24	2.7	64.8	5.0	-
Year 4	182	2.7	491.4	8.9	8.6
Art Room	98	2.7	264.6	2.6	8.6
Music	138	2.7	372.6	6.4	8.6
Practice 1	31	2.7	83.7	5.0	-

6 RECOMMENDATIONS

The Traffic Noise Assessment has been carried out to assess the traffic noise impact generated from Manns Road into the proposed Junior School Building. The façade requirements for the proposed Junior School Building to meet the internal noise criteria stated in Development near Rail Corridors and Busy Road – Interim Guideline are detailed in the following sections.

6.1 GLAZING

Table 8 and **Table 9** detail the minimum sound insertion loss of glazing for rooms in the Entry Level and Lower Level 1 of the building and should be read in conjunction with the Table Notes 1 below.

Table 8: Glazing Requirement for Entry Level

Room Type	Minimum Required R_w (dB)								Comply with Criteria with window open
	Northern Façade		Southern Façade		Eastern Façade		Western Façade		
	Window	Door	Window	Door	Window	Door	Window	Door	
Kinder	30	30	30	-	-	-	-	-	Yes
Quiet 1	31	-	-	-	-	-	-	-	Yes
Year 1	31	31	30	-	-	-	-	-	Yes
Quiet 3	33	-	31	-	-	-	-	-	Yes
Year 2	31	31	30	-	-	-	-	-	Yes
Gallery	-	-	30	-	30	30	30	30	Yes
Staff Study	-	-	31	-	31	30	-	-	Yes
Office 1	-	-	-	-	-	-	30	-	Yes
Office 2	-	-	-	-	-		30	-	Yes
Interview	-	-	-	-	-	-	30	-	Yes

Table 9: Glazing Requirement for Lower Level 1

Room Type	Minimum Required R_w (dB)		Comply with Criteria with window open
	Northern Façade		
	Window	Door	
Year 3	31	31	Yes
Quiet 5	31	-	Yes
Year 4	31	31	Yes
Art Room	31	31	Yes
Music	31	31	Yes
Practice 1	33	-	Yes

Table Notes 1:

1. An example of suitable construction materials to achieve the minimum required Rw are listed as follows:
    - Rw 30 - 3mm thick monolithic glass
    - Rw 31 - 6mm thick monolithic glass
    - Rw 33 - 6.38mm thick laminated glass
2. Where a glass door is not in use, equivalent suitable alternatives for the following minimum Rw are:
    - Rw 30 - solid core 35 mm thick plywood door, soft plastic gasket around sides and top and drop seal at base.
    - Rw 31 - solid core 44 mm thick plywood door, soft plastic gasket around sides and top and drop seal at base.
3. All windows/doors should be well sealed (air tight) when closed with good acoustic seals around the top and bottom sliders and also with other sliding doors and fixed section. Any air gap will significantly reduce the performance of the glazing in terms of the ability to attenuate noise. All of the above assumes that the glass will be properly sealed airtight. Note that standard (mohair) seals do not have noise reduction properties. Raven seals and Schlegel seals are example of acoustics seals.
4. With regard to other rooms in the building not listed in **Table 8** and **Table 9**, i.e. where an Rw value has not been specified for the boys toilet, girls toilet, access wc, wc1, wc2, and second wc1 on the Entry Level of the building, a minimum insertion loss of Rw 30 is considered sufficient.
5. Equivalent constructions that achieve the minimum required Rw are acceptable. The manufacturer information of the equivalent construction should be forwarded to Vipac for review and approval.

6.2 WALLS

Table 10 and **Table 11** detail the minimum sound insertion loss of glazing for rooms in the Entry Level and Lower Level 1 and it should be read in conjunction with the Table Notes 2 below.

Table 10: Facade Requirements for Entry Levels

Room Type	Minimum Required Rw (dB)			
	Northern Façade	Southern Façade	Eastern Façade	Western Façade
Kinder	38	38	38	38
Quiet 1	38	-	38	-
Year 1	38	-	-	-
Quiet 3	43	38	43	43
Year 2	38	-	-	-
Gallery	-	38	38	38
Staff Study	-	38	38	-
Office 1	-	38	-	38
Office 2	-	-	-	38
Interview	-	-	-	38

Table 11: Façade Requirements for Lower Level 1

Room Type	Minimum Required Rw (dB)
	Northern Façade
Year 3	38
Quiet 5	43
Year 4	43
Art Room	43
Music	43
Practice 1	44
Practice 2	44

Table Notes 2:

1. An example of suitable construction materials to achieve the minimum required Rw are listed as follows:
    - Rw 38 - 0.42mm metal sheeting over steel stud at 600m maximum centres over one layer of 13mm GYPROCK plasterboard CD with cavity infill as detailed in **Section 6.4.2**.
    - Rw 43 - 0.42mm metal sheeting over steel stud at 600m maximum centres over one layer of 13mm GYPROCK plasterboard CD and another layer of 10mm GYPROCK plasterboard CD with cavity infill as detailed in **Section 6.4.2**.
    - Rw 44 - 0.42mm metal sheeting over steel stud at 600m maximum centres over two layers of 13mm GYPROCK plasterboard CD with cavity infill as detailed in **Section 6.4.2**.
2. Where higher durability and/or water resistance is required, 6mm fibre cement (FC) sheeting could be used in-lieu of the 13mm plasterboard and 9mm FC in-lieu of 16mm plasterboard.
3. With regard to other rooms in the building not listed in **Table 10** and **Table 11**, i.e. where an Rw value has not been specified for the boys toilet, girls toilet, access wc, wc1, wc2, and second wc1 on the Entry Level of the building, a minimum insertion loss of Rw 38 is considered sufficient.
4. Equivalent constructions that achieve the minimum required Rw are acceptable. The manufacturer information of the equivalent construction should be forwarded to Vipac for review and approval.

6.3 ROOF

A steel sheet roof sheeting of minimum 0.42mm with at minimum Bradford Anticon 55 insulation over battens, ceiling joist or trusses at 600mm max centres over one layer of 13mm plasterboard with cavity infill as detailed in **Section 6.4.2.**

Where higher durability and/or water resistance is required, 6mm fibre cement (FC) sheeting could be used in-lieu of the 13mm plasterboard and 9mm FC in-lieu of 16mm plasterboard.

6.4 GENERAL

6.4.1 ACOUSTIC SEALANT

We note that for the acoustic integrity of building elements to be maintained, all gaps and interfaces along the junctions and joints of linings must be sealed with an appropriate acoustic grade sealant. Penetrations for mechanical or electrical services must be properly blocked and sealed around the ductwork/cabling to ensure the intended acoustic rating of the partition is retained.

Appropriate acoustic caulking products include:

- Bostik Firemastic
- Bostik Seal-n-flex 2637
- Pyropanel Multiflex
- Boral Fyreflex
- Dow-Corning 790 Silicone
- Dow-Corning 795 Silicone
- Sika Sikaflex-11 FC
- Fosroc Flamex 3

6.4.2 CAVITY INFILL

Where cavity infill is recommended, equivalent alternatives are:

- Fibreglass - 50mm, 22kg/m^3
- Rockwool - 50mm, 38kg/m^3
- Polyester - 900gsm

6.4.3 CEILING OVERLAY

Where ceiling overlay is recommended, equivalent alternatives are:

- Glasswool - 100mm, 12kg/m^3
- Rockwool - 100mm, 38kg/m^3
- Polyester - 100mm, 32kg/m^3

7 CONCLUSION

Vipac has carried out an Acoustic Assessment associated with the internal noise level requirements for the proposed Junior School Building at St. Phillip Christian College Gosford Campus, Narara Creek Road, Narara.

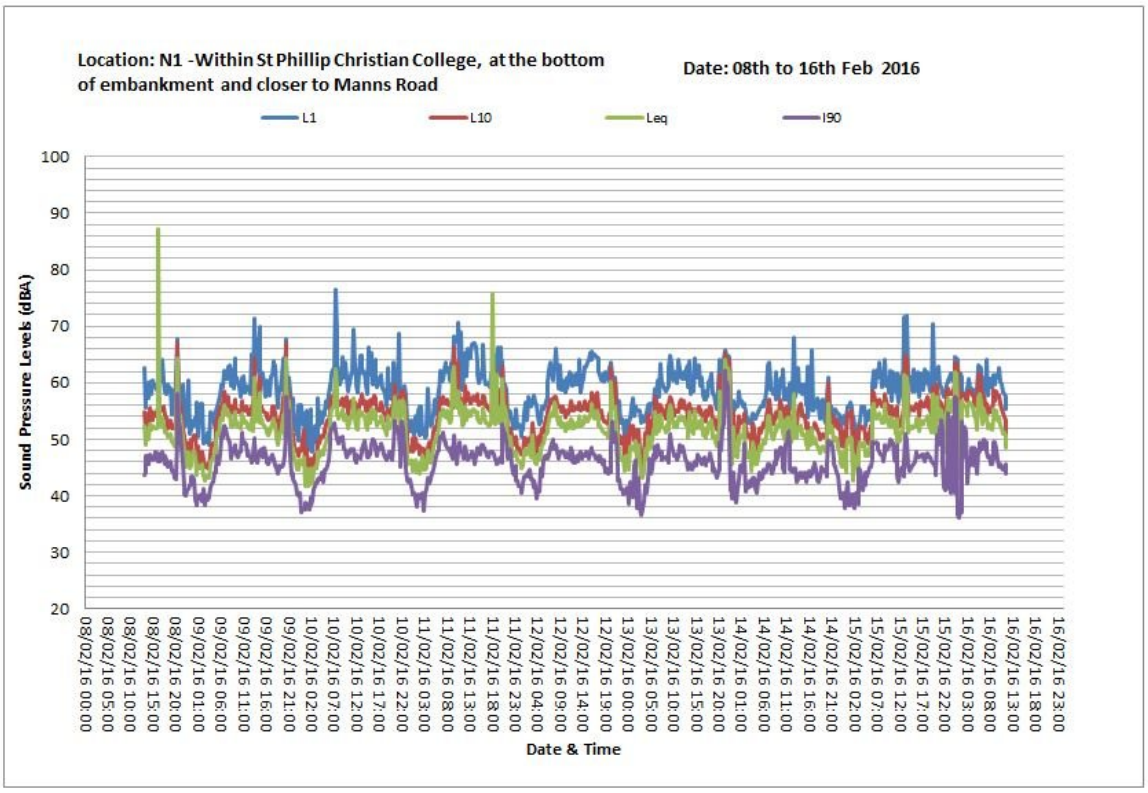
The recommendations regarding the building's glazing, walls and roof specifications required in order to achieve the relevant internal noise levels are presented in **Section 6**.

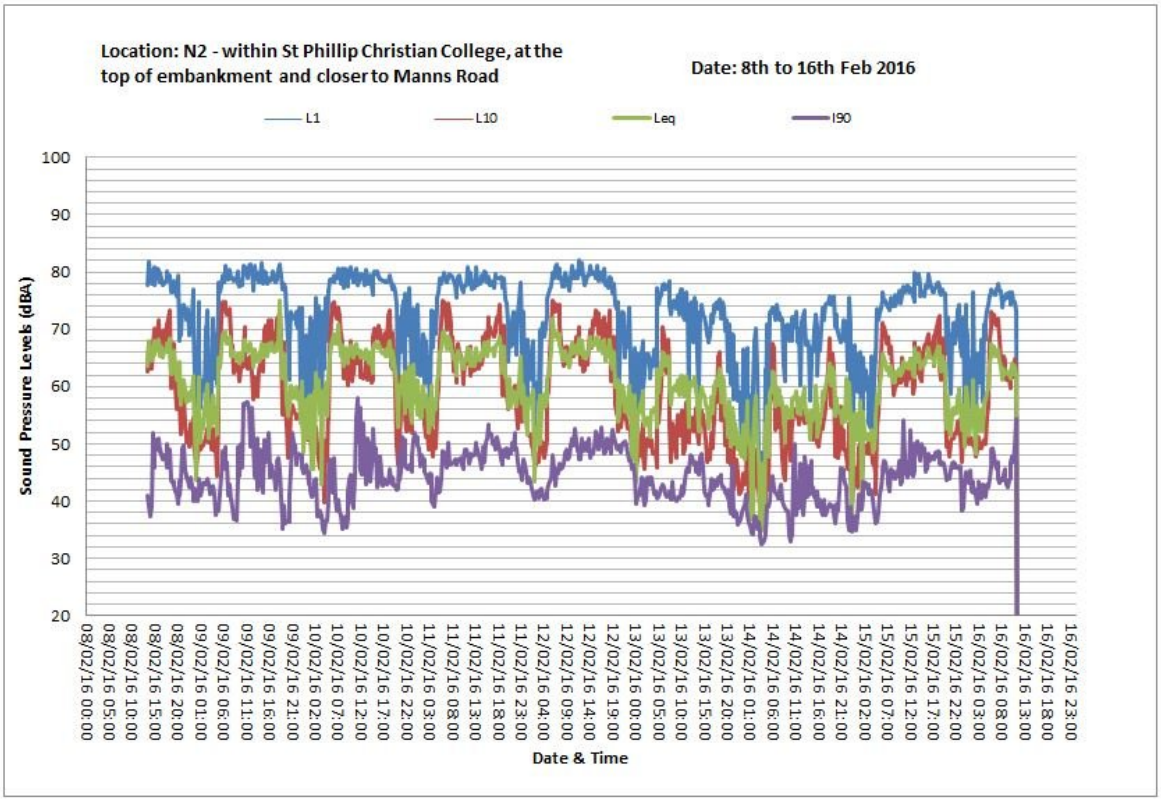
By following the recommendations and requirements outlined within this noise impact assessment, the proposed building design is expected to achieve an acceptable noise environment, internally within the property.

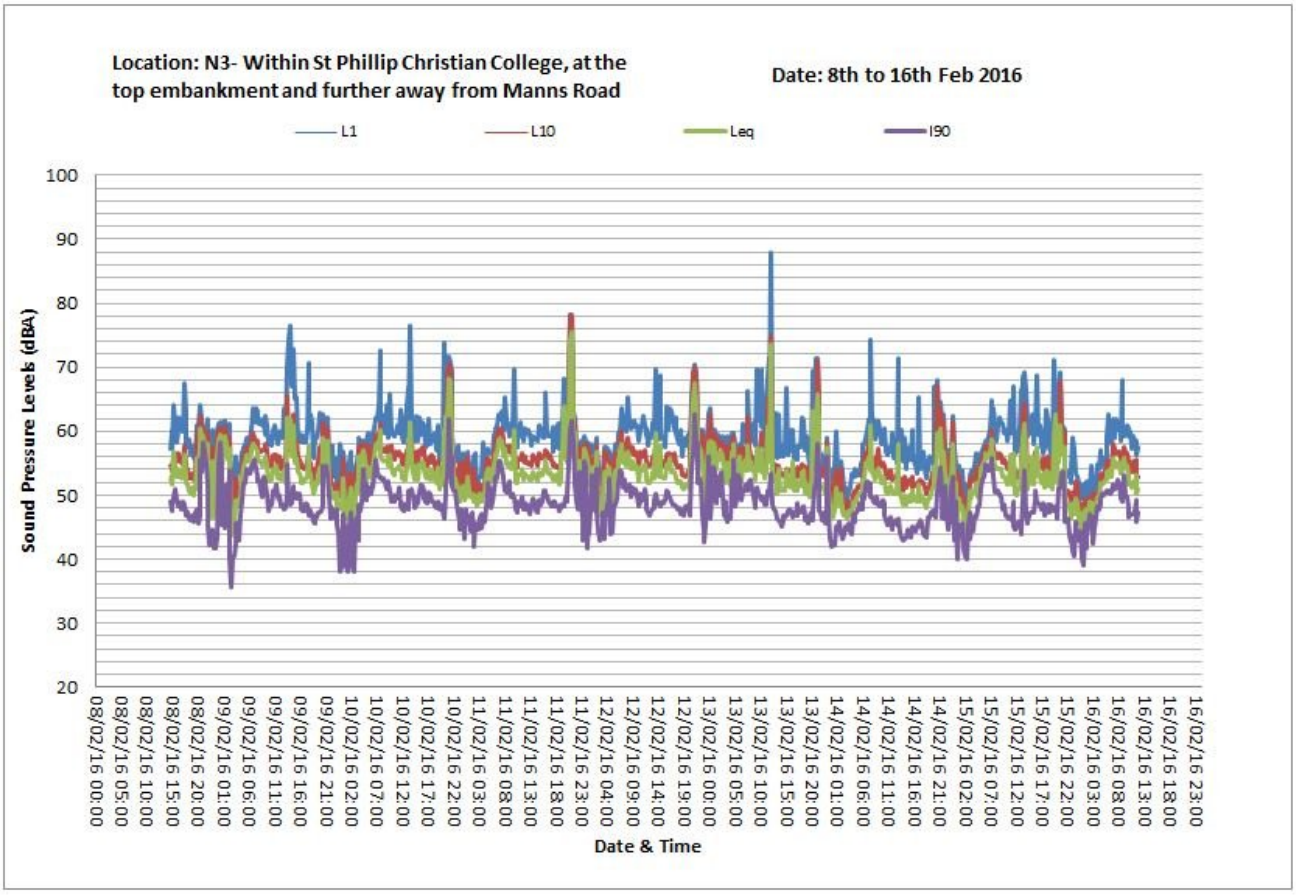
Service rooms such as toilets, store rooms etc. are not assessed in this report for the reason that these areas are not habitable rooms.

It is Vipac's professional opinion that the proposed Junior School Building is acceptable from an Acoustic point of view, provided the recommendations detailed in **Section 6** are implemented.

Appendix A NOISE LOGGING RESULTS






Location: N3- Within St Phillip Christian College, at the top embankment and further away from Manns Road
Date: 8th to 16th Feb 2016
L1
L10
Leq
l90
Sound Pressure Levels (dBA)
100
90
80
70
60
50
40
30
20
08/02/16 00:00
08/02/16 05:00
08/02/16 10:00
08/02/16 15:00
08/02/16 20:00
09/02/16 01:00
09/02/16 06:00
09/02/16 11:00
09/02/16 16:00
09/02/16 21:00
10/02/16 02:00
10/02/16 07:00
10/02/16 12:00
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11/02/16 08:00
11/02/16 13:00
11/02/16 18:00
11/02/16 23:00
12/02/16 04:00
12/02/16 09:00
12/02/16 14:00
12/02/16 19:00
13/02/16 00:00
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13/02/16 20:00
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Date & Time